ing the Lake region it disappeared, owing to the rapid advance of areas of low pressure to the westward.

IX.—This disturbance apparently developed over the southern plateau region, and moved eastward over Colorado on the 21st and Kansas on the 22d, after which it was apparently forced southward by increased pressure from the Rocky Mountain regions, and disappeared without causing any marked change in the weather conditions of the central valleys.

X.—This disturbance was at no time central within the limits of stations of observation. It was first observed north of Montana on the 22d, and passed eastward north of the Dakotas during the 23d, attended, however, by violent south to west winds in the Northwest. As this storm approached Lake Superior general rains occurred in the central valleys and strong gales in the Lake region, the wind reaching a velocity of fifty-six miles per hour at Chicago, Ill. After the centre of disturbance reached the vicinity of Lake Superior the direction of movement changed to the northeast and the storm apparently passed over the Hudson Bay region. The general rains extended eastward to the Atlantic coast, the heaviest rainfalls occurring in the south Atlantic states, resulting in some damage to growing crops.

XI.—Was first observed north of Montana on the 26th, and, as in the case of numbers vii and viii, which had their origin in the same locality, this disturbance quickly separated, forming secondary depressions, first on the 28th when the principal disturbance was apparently central over North Dakota. Minor disturbances were observed in Colorado, southern Minnesota, and to the north of North Dakota. These secondary disturbances disappeared after the 28th, when the principal disturbance moved southward over the Missouri Valley, covering the eastern slope of the Rocky Mountains and greatly elongated in a north and south direction. It was forced southward by an area of high pressure to the northwestward, and after reaching the west Gulf states it could no longer be defined by barometric lines, although heavy rains occurred over Arkansas near the centre of disturbance on the 31st.

XII.—Was a slight disturbance which developed on the middle Atlantic coast on the 27th, within the limits of a trough of low pressure which extended from Florida to northern New York. It apparently passed off the middle Atlantic coast to the northeastward, increasing greatly in energy as it approached Nova Scotia. Strong northerly and westerly gales occurred on the New England coast on the 28th, when the centre was to the south of, and near, Yarmouth, N. S. Marine reports indicate that this storm continued to increase in energy as it approached the Newfoundland coast during the 29th, and westerly gales were reported on that coast on the 30th and 31st.

Tabulated statement showing principal characteristics of areas of high and low pressure.

Barometer.	First observed.			Last observed.		Duration.	Velocity per hour.	Maximum abnormal changes in pressure in twelve hours, with maximum abnormal changes in temperature and maximum wind velocities in connection therewith.									
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Rise.	Station.	Date.	Fall.	Station.	Date.	Miles per hour.	Direction.	Station.	Date
High areas.		°	°	°	°	*Days.*	*Miles.*	*Inch.*			°						
I	1	47	95	40	60	2·0	44	·38	La Crosse, Wis	1	23	Springfield, Ill	1	42	ne.	Chicago, Ill	1
II	2	55	104	52	80	1·5	33	·52	Duluth, Minn	3	30	Huron, S. Dak	3	52	n.	Huron, S. Dak	3
III	5	54	112	31	77	5·0	24	·40	Calgary, N. W. T	5	14	Savannah, Ga	8	40	n.	North Platte, Nebr Sandy Hook, N. J	5 8
IV	9	55	99	43	62	3·0	35	·52	Des Moines, Iowa	10	29	Indianapolis, Ind	10	36	e.	Swift Current, N. W. T	9
V	11	54	113	47	54	8·0	31	·52	Calgary, N. W. T	14	33	Fort Custer, Mont	11	48	nw.	Bismarck, N. Dak	14
VI	16	45	130	48	61	6·0	30	·58	Quebec, Quebec	21	32	Northfield, Vt	20	46	nw.	Huron, S. Dak	18
VII	21	44	128	48	77	8·0	20	·38	Fort Custer, Mont	25	15	Fort Custer, Mont	25	60	nw.	Bismarck, N. Dak	25
VIII	24	50	65	46	65	2·5	15	·22	Yarmouth, N. S	25	17	Father Point, Quebec	26	30	ne.	Quebec, Quebec	25
IX	30	54	108	52	95	1·5	18	·42	Swift Current, N. W. T	29	27	Chicago, Ill	31	40	ne.	Fort Buford, N. Dak	31
Mean		51	116	45	70	4·2	28	·44			24			44			
Low areas.								Fall.			Rise.						
I	1	38	111	50	62	6·0	26	·26	Baltimore, Md	4	14	Cleveland, Ohio	5	40	ne.	Quebec, Quebec	5
II	1	53	109	45	82	1·5	50	·62	Qu'Appelle, N. W. T	1	26	Bismarck, N. Dak	1	42	ne.	Chicago, Ill	3
III	8	40	107	42	79	2·5	30	·42	Fort Sully, S. Dak	7	24	Rapid City, S. Dak	7	60	ne.	do	10
IV	10	47	120	47	71	4·0	33	·36	North Platte, Nebr	11	16	Valentine, Nebr	11	52	n.	Fort Sully, S. Dak	12
V	13	52	108	49	68	2·5	40	·50	Swift Current, N. W. T	13	22	Rapid City, S. Dak	13	46	nw.	Bismarck, N. Dak	14
VI	15	55	102	51	68	2·0	40	·46	Qu'Appelle, N. W. T	15	17	Green Bay, Wis	16	64	sw.	Montreal, Quebec	17
VII	16	51	113	52	60	4·5	38	·44	Concordia, Kans	17	21	Chicago, Ill	18	44	w.	Father Point, Quebec	21
VIII	19	50	114	52	82	3·5	20	·40	Swift Current, N. W. T	21	15	do	22	54	sw.	Dodge City, Kans	20
IX	20	38	117	39	99	1·5	33	·30	Denver, Colo	21	14	Denver, Colo Cheyenne, Wyo	21	40	nw.	Omaha, Nebr	22
X	22	52	112	53	86	3·5	20	·50	Port Arthur, Ont	24	16	Calgary, N. W. T	22	60	nw.	Bismarck, N. Dak	25
XI	26	50	112	34	99	4·5	20	·58	Calgary, N. W. T	26	21	Fort Custer, Mont	26	56	nw.	Fort Buford, N. Dak	28
XII	27	40	74	46	56	3·0	17	·24	Nantucket, Mass	27	11	Sydney, C. B. I	30	60	ne.	Nantucket, Mass	28
Mean		47	108	47	76	3·2	31	·42			18			52			

NORTH ATLANTIC STORMS FOR MAY, 1890 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during May, 1890, are shown on chart i. These paths have been determined from international observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Nine depressions have been traced for May, 1890, the average number traced for the corresponding month of the last five years being ten. The greatest number of depressions previously traced for May was eleven, in 1887 and 1888, and the least number was nine, in 1889. Of the depressions traced for the current month four were continuations of areas of low pressure which first appeared over the North American continent; one apparently originated off the middle Atlantic coast; one first appeared over the southern part of the Banks of Newfoundland; two were first located between the Azores and the British Isles; and one is traced southeastward west of the British Isles. The storms generally pursued irregular paths over mid-ocean and near the British Isles, and but one depression traversed the ocean from coast to coast. Over the western part of the ocean the storm periods were the 5th to 12th, 14th, 17th to 21st, and 25th to 31st, the severest storms occurring south of Newfoundland and over the Grand Banks during the 11th and 12th. Over mid-ocean the weather of the first decade was generally fair and settled, and from the 12th to 15th, 17th, 18th, and 20th to 29th unsettled weather prevailed, the severest storms being reported on the 12th, 13th,

20th, and 21st. Over the eastern part of the ocean unsettled and generally stormy weather continued during the first two decades of the month, the severest disturbances being noted northwest of the British Isles on the 13th and 14th.

Compared with the corresponding month of the last five years the depressions traced over the north Atlantic Ocean for May, 1890, were deficient in number and energy. But one storm of pronounced strength passed eastward from the American continent; there were but four dates on which storms exceeding in force fresh to strong gales were reported over mid-ocean; and, although the weather was generally unsettled over the eastern part of the ocean, gales of marked severity were noted near the British Isles on two dates only.

The movements of areas of high pressure over the north Atlantic during the month were as follows: On the 1st the pressure was high from Bermuda eastward, south of the fortieth parallel, to the Azores. On the 2d an area of high pressure which had advanced from the upper Missouri valley extended from New England to the upper Ohio valley; by the 3d this area of high pressure occupied the ocean south of the fiftieth parallel and west of the thirtieth meridian; during the next six dates it remained nearly stationary south and southeast of Newfoundland. On the 9th an area of high pressure which had advanced from the west occupied the ocean from the south Atlantic coast to Bermuda; by the 10th this area of high pressure had extended eastward and united with the area of high pressure which extended from Newfoundland and Bermuda to the Azores. From the 10th to 21st the pressure continued generally high from the sixtieth meridian to the Azores, the northern limit of this area of high pressure alternately contracting southward and extending northward of the fortieth parallel. On the 21st an area of high pressure which had advanced from the west extended from the lower lakes to the south Atlantic states; by the 22d this area had united with the area of high pressure which extended southward from Newfoundland. During the 23d and 24th there was a rapid decrease in pressure over and near Newfoundland, and on the latter-named date the pressure was generally low over the entire ocean. On the 25th and 26th an area of high pressure extended from New England and the Canadian Maritime Provinces southward to the fortieth parallel, after which it apparently disappeared by a decrease in pressure.

The following are brief descriptions of the depressions traced for May, 1890:

1.—On the 1st the pressure was low south and southwest of the British Isles, and reports of the 2d locate a well-defined area of low pressure about midway between the British Isles and the Azores, with central pressure about 29.65 (753), and fresh gales. By the 3d this depression had advanced to west of Ireland, with a marked decrease in pressure and increase in energy, after which it apparently moved northeast beyond the region of observation.

2.—This depression apparently developed southwest of the British Isles where it was central on the 4th, with pressure falling to about 29.30 (744) and fresh to strong gales. During the next four days the depression remained nearly stationary south of the British Isles, with evidence of considerable energy, after which it passed eastward beyond the region of observation.

3.—This depression apparently developed off the middle Atlantic coast on the 7th, and on the 8th was central in about N. 39°, W. 68°, whence it passed northeastward and on the 9th was central over the Gulf of Saint Lawrence, after which it moved north of the region of observation without evidence of marked energy.

4.—This depression was a continuation of low area iii, which moved from the upper Ohio valley over New England during the 10th. On the morning of the 11th the depression was central off the eastern coast of Nova Scotia, whence it moved rapidly north of east, with a marked increase in energy, to northeast of the Grand Banks by the 12th, where pressure falling to about 29.30 (744) and heavy gales were reported, and thence advanced northeastward to about the twenty-fourth meridian by the 13th, attended by pressure falling below 29.00 (737) and heavy gales, after which it passed north of the region of observation, its disappearance being followed until the 16th by low pressure northwest and north of the British Isles.

5.—This depression was a continuation of low area v, which advanced eastward north of the Gulf of Saint Lawrence during the 16th. On the 17th the depression was central north of Newfoundland, whence it moved rapidly eastward, reaching the thirty-fifth meridian by noon, Greenwich time, of the 18th, and united with a depression central over or near the British Isles on the 19th, its passage being unattended by gales of marked strength.

6.—This depression was central west of Ireland on the 17th, whence it had apparently advanced from the northwest. By the 18th the storm-centre had moved southeast to off the southeastern extremity of Ireland, after which it disappeared over or north of the British Isles. This depression exhibited marked energy and was attended by fresh to strong gales.

7.—This depression was a continuation of low area vi, which passed eastward over the Gulf of Saint Lawrence and Newfoundland during the 18th. By the 19th the centre of disturbance had moved eastward to the fortieth meridian, with pressure falling to about 29.40 (747) and fresh to strong gales, and thence moved eastward to about the thirtieth meridian by the 20th, attended by heavy gales. From the 20th to the 26th, inclusive, this depression remained central between the twentieth and thirtieth meridians, attended by fresh to strong gales, after which it apparently moved westward and united with number 8 east of the Banks of Newfoundland. The irregular course of this depression after the 21st was probably due to high pressure to the eastward. On the 22d there was a gradient of about .60 inch between the tenth and twentieth meridians, and this gradient apparently remained about the same during the 23d; on the 24th it amounted to about .50 inch, and on the 25th and 26th to about .40 inch, and during this period the pressure was apparently high northwest of the British Isles. The high pressure to the east and north, together with the influence of the depression to the westward, had the apparent effect of causing the final and decided westerly movement of the depression after the 26th.

8.—This depression was first clearly defined on the southeast edge of the Banks of Newfoundland by reports of the 25th, where it remained nearly stationary during the 26th and 27th, attended by fresh to strong gales and pressure falling to about 29.25 (743) on the latter-named date; it moved slowly northnortheast by the 28th with a marked increase in energy, and on the 29th was central northeast of the Grand Banks, attended by heavy gales, after which it recurved to the southwestward and united with a depression which had moved south of east from New England to the fortieth parallel. High pressure to the eastward apparently deflected this depression to the westward after the 28th.

9.—This depression was a continuation of low area xii, which passed off the New England coast during the 28th and moved thence east-southeast to the fifty-sixth meridian by the 29th, with pressure falling to about 29.20 (742) and heavy gales. By the 30th the centre of disturbance had moved northeastward over the Grand Banks without evidence of loss of energy, after which it disappeared north of the region of observation.

OCEAN ICE IN MAY.

The table below shows that for May, 1890, ice was reported less than one-half degree south and about seven degrees east of the average southern and eastern limits of Arctic ice for the month, as determined from reports of the preceding seven years. In two years, 1883 and 1887, ice was reported farther south than for the current month, and in 1887 the southernmost ice reported for May during the period named, field ice in N. 39° 38′, W. 46° 00′, was noted on the 20th. The easternmost ice reported for the current month, a medium sized and two small icebergs in the position given, was nearly one-half degree east of the easternmost ice reported for May during the

last seven years. For the current month ice was encountered most frequently along and off the southeast and east edges of the Banks of Newfoundland. During the early part of the month Gulf ice was reported between Cape Breton Island and Newfoundland, and a report of the 28th stated that the Straits of Belle Isle were solidly packed with ice. Although enormous quantities of Arctic ice have commonly been encountered over and near the Grand Banks in May, more especially in 1885, 1886, and 1887, the aggregate quantity for the current month probably exceeded that noted for May during the last seven years, and much delay and considerable damage was caused to shipping. The limits of the region within which Arctic ice was reported for May, 1890, are shown on chart i by ruled shading.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for May, during the last eight years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
May, 1883	40 30	47 00	May, 1883	45 40	45 12
May, 1884	41 30	47 30	May, 1884	43 30	44 50
May, 1885	40 50	48 15	May, 1885	42 30	40 10
May, 1886	41 36	51 30	May, 1886	48 55	46 13
May, 1887	39 38	46 00	May, 1887	39 38	46 00
May, 1888	41 00	46 00	May, 1888	41 00	46 00
May, 1889	43 07	55 47	May, 1889	49 46	36 48
May, 1890	40 50	50 28	May, 1890	44 12	36 25

FOG IN MAY.

The limits of fog belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on twenty-nine dates; between the fifty-fifth and sixty-fifth meridians on twenty dates; and west of the sixty-fifth meridian on seventeen dates. Compared with the corresponding month of the last two years the dates of occurrence of fog near the Grand Banks numbered thirteen more than the average; between the fifty-fifth and sixty-fifth meridians eight more than the average; and west of the sixty-fifth meridian four less than the average. The 14th and 23d were the only dates for which fog was not reported over or near the Grand Banks for the current month. On all other dates, save the 3d, 4th, 12th, and 22d, it occurred attending the approach or passage of areas of low pressure, and on the dates named high pressure with falling barometer and threatening or rainy weather prevailed. Between the fifty-fifth and sixty-fifth meridians fog occurred with the approach or passage to the northward of low-pressure storms, save on the 3d, 4th, and 22d, when the barometer was high and falling, with threatening weather or rain in that region. West of the sixty-fifth meridian fog generally occurred with the passage to the northward of low-pressure storms, save on the 3d, 4th, 12th, and 22d, when high and falling barometer and unsettled weather prevailed in that region. On the 3d dense fog prevailed along the coasts of Massachusetts, Rhode Island, Connecticut, and New Jersey, with south to southeast winds, threatening weather, and a low-pressure storm central over the Lake region. On the 4th dense fog was reported along the coast from Maine to New Jersey with the passage of a low-pressure storm from the Ohio Valley to Pennsylvania. On the 5th dense fog prevailed off the coast from Maine to Connecticut with the passage of a low-pressure storm from New England to the Gulf of Saint Lawrence. On the 6th dense fog prevailed along the New England coast with the passage of a low-pressure storm from the middle Atlantic states to the Gulf of Saint Lawrence. On the 14th dense fog prevailed off the New England coast with the passage of a low-pressure storm over the Canadian Maritime Provinces. On the 15th and 16th dense fog prevailed along the New England coast with the passage of a low-pressure storm over the Saint Lawrence Valley, and the Signal Service observer at New London, Conn., reports that a large fleet of vessels was detained in that port by fog on those dates. On the 19th dense fog prevailed along the coast from Maine to New Jersey with the passage of a low-pressure storm over the Saint Lawrence Valley.

The following are limits of fog-areas on the north Atlantic Ocean, west of the fortieth meridian, for May, 1890, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
1	44 10	44 25	43 57	44 53	15	40 26	72 36	40 23	70 39
1	39 50	49 50	39 50	47 40	15-16	40 40	60 27	41 30	54 20
1-2	44 07	49 20	43 48	50 27	15-16	41 05	66 30	40 35	71 20
1-2	48 10	48 00	46 32	55 50	16	37 00	73 30	37 05	73 34
2	41 49	59 06	41 52	55 04	16	41 08	50 10	41 14	49 17
2	42 20	49 00	41 41	51 00	16-17	41 50	52 30	41 45	52 50
2	41 59	63 33	42 05	65 34	17	41 05	64 30	40 40	68 48
3	41 52	52 04	42 38	47 56	17-18	41 48	55 40	41 56	64 11
3	41 10	59 40	41 08	60 00	17-18	46 13	40 50	44 40	44 42
3	42 00	67 00	41 45	68 00	18	41 28	64 10	41 25	64 25
3	41 26	49 56	41 26	52 19	19	40 42	71 35	40 38	72 20
4	40 46	60 39	40 49	59 29	19	43 51	44 49	43 40	45 12
4	40 30	71 15	Fire Island.		19	42 04	51 12	42 02	51 37
4	48 38	48 20	48 09	49 41	19	47 09	41 16	47 05	41 36
4-5	42 12	47 44	42 14	52 36	19-20	43 49	53 56	43 44	54 22
5	41 19	59 19	41 14	61 47	20	43 01	63 58	42 40	67 50
5	41 39	51 10	41 46	50 15	20-21	46 28	47 05	46 27	51 28
5-6	40 14	68 00	Sandy Hook.		20-21	43 12	58 51	43 05	60 25
6	47 02	47 00	47 17	46 05	21	46 25	52 41	46 40	54 51
6-7	40 40	66 28	39 43	70 37	21	45 10	45 07	44 57	46 15
6-7	42 21	58 03	42 44	65 50	21-22	45 30	57 00	46 50	60 00
7	48 11	44 01	48 24	43 26	22	41 00	69 12	40 58	69 55
7	42 10	63 35	43 13	60 50	22	46 43	40 44	46 58	41 08
7-8	42 44	49 56	42 45	50 38	22	44 50	45 00	44 40	46 50
8-9	43 15	60 40	45 43	54 39	24	42 15	50 40	42 09	51 00
8-9	43 04	45 36	42 33	48 10	24-25	43 01	48 10	42 12	50 00
9	45 43	41 03	45 36	41 22	25-26	45 42	44 25	45 08	46 57
9	42 48	58 27	42 49	58 55	25-26	48 02	48 58	46 20	55 20
9-10	44 37	44 11	42 39	51 25	26	46 27	46 29	45 53	48 45
11	41 14	66 01	41 07	66 37	27	42 14	48 32	41 54	49 44
11	41 09	50 00	41 10	49 15	27	40 40	70 50	40 35	72 10
12	43 43	52 26	43 59	50 37	27-28	48 20	45 00	47 20	49 00
12-13	41 10	65 48	40 31	70 42	27-28	45 50	59 53	46 17	60 00
13	38 57	71 01	38 57	70 03	27-28	39 35	72 09	39 25	73 11
13	42 53	50 43	42 43	53 10	28-29	42 27	67 50	42 26	68 30
13-14	42 00	61 51	42 00	68 33	29-30	43 46	48 13	43 22	50 27
14-15	40 48	68 11	Sandy Hook.		30-31	43 07	49 40	42 53	50 34
15	43 48	45 45	42 12	50 57	30-31	47 18	43 07	43 52	51 43

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for May, 1890, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

The mean temperature for May, 1890, was highest in the lower Rio Grande and the central Gila valleys, where it was above 80°. The mean readings were above 70° south of a line traced from central North Carolina west-southwest to central Mississippi, thence northwest to central Arkansas, thence westward to west-central Texas, thence southward to southeastern New Mexico, thence irregularly westward to southeastern Arizona, thence northwestward over southern Nevada to central California, and thence east of south over California to Lower California. The mean temperature was lowest on the northeast shore of Lake Superior and at the more elevated stations in west-central Colorado, where it fell below 40°, and the mean values were below 50° in the Canadian Maritime